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The 1982 Peregrine Falcon/Raptor Survey in the Central Arctic, Alaska

by Ted Swem
Bob Dittrict
Jim Silva

Bureau of Land Management
Alaska

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INTRODUCTION

The 1982 Bureau of Land Management (BLM) peregrine falcon (Falco peregrinus tundrius) nesting survey was a continuing effort to visit active and historic peregrine falcon nesting sites within the National Petroleum Reserve-Alaska (NPR-A) (see Figures 1 and 2). Raptor surveys within NPR-A have been conducted periodically since the early 1950s, with yearly surveys being conducted since 1978. The 1982 survey was a continuation of previous efforts to locate and document peregrine falcon and other raptor species within NPR-A. The 1982 nesting success of peregrine falcons along the Colville River from the mouth of the Etivluk River to Ocean Point was recorded and compared to data from previous surveys (see Table 1).

An emphasis on banding of peregrine falcon nestlings continued in 1982 in an attempt to accrue a more complete picture of the life cycle and demographics of the NPR-A population. Interest also continued in 1982 for surveying and banding other cliff nesting raptors in NPR-A: gyrfalcons (Falco rusticolus) and rough-legged hawks (Buteo lagopus). Banding, to help identify migration routes and wintering areas of peregrine falcons and other raptor species within NPR-A, has been a major objective in many of the previous surveys over the past decade.

The results of the nesting survey including cliff locations, banding data, and raptor nesting success are included in this report.

OBJECTIVES

--To locate and document peregrine falcon and other raptor use of the Colville River and other selected areas within NPR-A.

--To locate nests and band young of all raptors when possible.

--To collect addled eggs, shell fragments and prey remains from peregrine falcon nests for pesticide residue analysis.

--To minimize raptor disturbance during the 1982 survey.

--To photograph all cliffs or bluffs along the Colville River, from the mouth of the Etivluk River to Ocean Point to help document nesting locations.

METHODS AND STUDY AREAS

Three different methods were used to survey areas within NPR-A for raptor reproduction. The differences reflect the relative remoteness of the areas surveyed.

1. Floating - Floating the rivers in inflatable rafts has proven to be the most effective survey technique. This allows a relatively unobtrusive approach to each bluff creating minimal disturbance to the birds' routine. An Avon raft equipped with a 7.5 horsepower motor was used as the vehicle for the survey whenever practical.

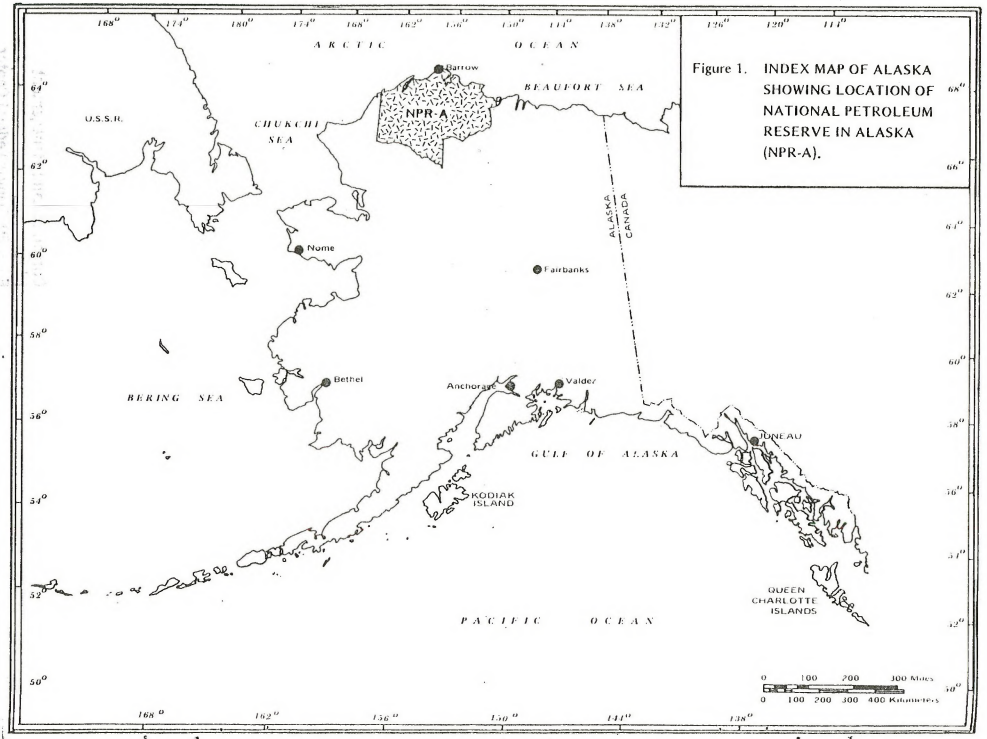

Figure 1. INDEX MAP OF ALASKA SHOWING LOCATION OF NATIONAL PETROLEUM RESERVE IN ALASKA (NPR-A).

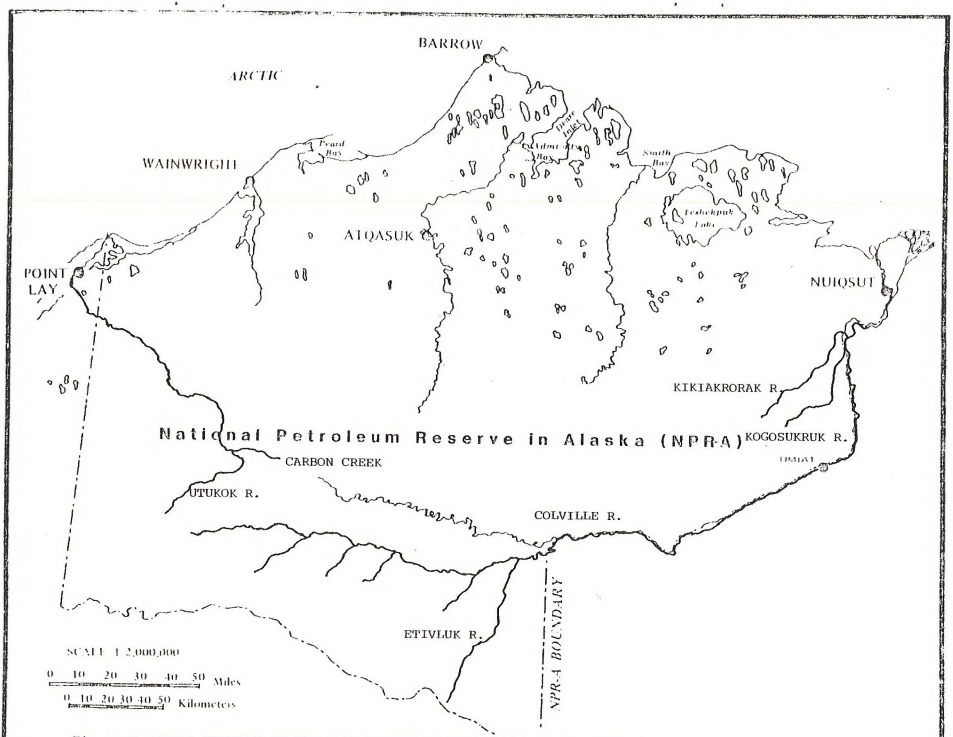

Figure 2. AREAS SURVEYED WITHIN THE NATIONAL PETROLEUM RESERVE - ALASKA, 1982.

2. Helicopter - Remote areas were surveyed by landing a helicopter within 1/2 to 1 km. of a bluff. Observers then hiked to the bluff to survey for nesting birds.

3. Auxiliary hiking - Hiking was used in areas with inadequate water depth adjacent to areas floated, and in areas with closely spaced bluffs adjacent to helicopter landing sites.

The methods and techniques used to survey the Colville River from the mouth of the Etivluk River to Ocean Point were very comparable to those used in previous surveys, while the methods and techniques used to survey other areas within NPR-A may have varied greatly from those of previous years. Because of the methods and techniques used, and the additional areas surveyed during 1982, only data from the Colville River was compared to previous years' data (see Table 1).

Nests for all raptors were located and when possible, the young birds were banded with standard U.S. Fish and Wildlife Service bands.

Attempts were made to locate failed nests of peregrine falcons and to collect any eggs or shell fragments present. Addled eggs, shell fragments, and prey remains, were also collected when possible at active peregrine falcon nests.

Colville River

Three float trips, and one helicopter flight were conducted along the Colville River during the 1982 survey. Two of the three float trips were made down the Colville River from the mouth of the Etivluk River to Ocean Point (see Figure 3). The first trip from June 15th-27th, documented the presence of adult raptors and raptor nests on cliffs. The second trip, between July 17th-29th, was designed to check nesting success and band the young. The third float trip was made down the upper Colville River on July 14th and 15th. The stretch surveyed began about 5 km. upriver from the confluence of the Nuka River and ended 3 km. upriver from the confluence of the Kaligwa River. A helicopter flight was conducted on July 13, to check two historic peregrine falcon nest sites near the confluence of the Ipnavik and Colville Rivers. Peregrine falcons, gyrfalcons, rough-legged hawks, and ravens were observed at 114 locations along the Colville River (see results section for details).

Grayling Creek

No birds were seen at one bluff on Grayling Creek (Section 23, T4S, R27W, Umiat Meridian) which was surveyed with the use of a helicopter on July 13th.

Etivluk River

Approximately 30 km. of the lower Etivluk River were surveyed for raptors using a raft on June 15th. Sixteen km. of the downstream portion were floated again on July 17th to document nesting success and band the young in nests found on the first trip.

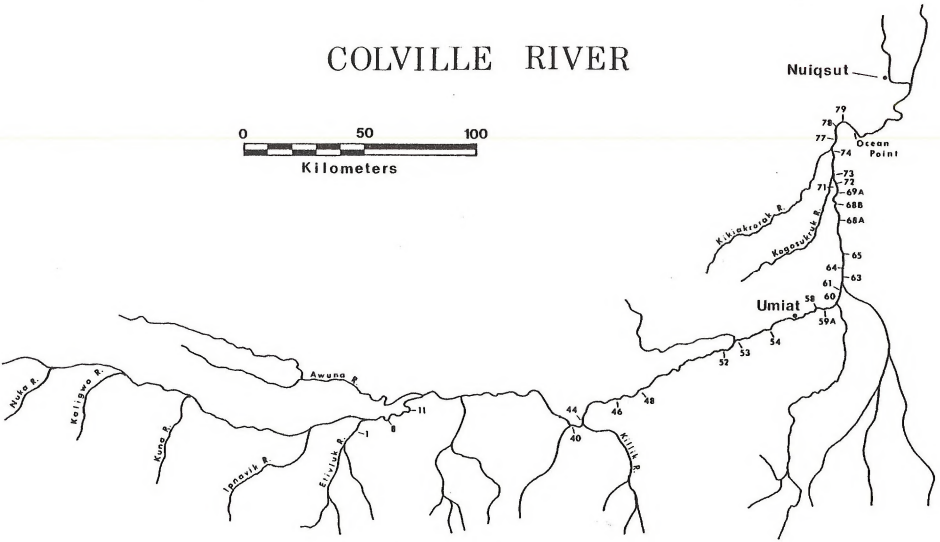

Figure 3. LOCATION OF CLIFFS ALONG THE COLVILLE RIVER, ALASKA AT WHICH PEREGRINE FALCONS WERE PRESENT IN 1982.[1]

[1] CLIFF NUMBERS TAKEN FROM WHITE AND CADE (1971).

Peregrine falcons and rough-legged hawks were found at eight locations along this stretch of the Etivluk River (see results section for details).

Otuk Creek

A single rough-legged hawk was observed on the bluffs along Otuk Creek (Section 20, T11S, R14E, Umiat Meridian) which was surveyed by hiking on July 14th.

Kogosukruk River

Most of the Kogosukruk River was surveyed by hiking approximately 76 km., beginning 9 km. up the "Branch of the Kogosukruk River" (Sec. 24, T2N, R2W, Umiat Meridian) and continuing to the confluence of the Kogosukruk and Colville Rivers. Two bluffs which appeared to have suitable nesting habitat from the air, had been overlooked during the ground survey. The bluff locations were:

(1) Section 3, T5N, R2E, Umiat Meridian or approximately 8 km. northwest of Kogo bench mark VABM 264.

(2) Section 9, T5N, R3E, Umiat meridian or approximately 6.5 km. northwest of Kogo bench mark VABM 264.

Three species of raptors were observed at 15 locations along the Kogosukruk River (see results section for details).

Kigiakrorak River

The entire river was examined by a helicopter overflight. Five bluffs on the river were considered suitable for peregrine nesting and were surveyed by landing and hiking to the bluff. Two were in the upper sections of the river and three were near the confluence with the Colville. The location of the five bluffs follows:

(1) Section 25, T3N, R4W, Umiat Meridian.

(2) Section 17, T3N, R4W, Umiat Meridian.

(3) Section 18, T7N, R2E, Umiat Meridian, or approximately 6 km. up river from its confluence with the Colville River.

(4) Section 9, T7N, R2E, or 5 km. up river from its confluence with the Colville River.

(5) Section 9, T7N, R2E, or 4 km. up river from its confluence with the Colville River.

One pair of peregrine falcons and a single rough-legged hawk were found on the Kigiakrorak River (see results section for details).

Utukok River

Three historic peregrine eyries were surveyed with the use of a helicopter. These bluffs were located in:

(1) Section 31, T2S, R34W, Umiat Meridian, or approximately 19 km. up river from the confluence of Disappointment Creek.

(2) Section 32, T2S, R34W, Umiat Meridian, or approximately 18 km. up river from the confluence of Disappointment Creek.

(3) Section 20, T3S, R36W, Umiat Meridian, or the intersection of Archimedes Ridge and the Utukok River.

No peregrine falcons were observed at any of the historical sites surveyed.

Carbon Creek

Two bluffs on Carbon Creek were surveyed with the use of a helicopter. These bluffs were located in:

(1) Section 1, T2S, R32N, Umiat Meridian.

(2) Section 31, T1S, R31W, Umiat Meridian. Both these sites are located approximately 9 km. upstream from its confluence with the Utukok River.

One pair of gyrfalcons and one pair of rough-legged hawks were observed on Carbon Creek (see results section for details).

Fossil Creek

No raptors were observed along the lower reaches of Fossil Creek (10 km.) which was surveyed by hiking, with ingress and egress provided by a helicopter.

Iteriak Creek

Bluffs along Iteriak Creek (Sections 21, 22, T10S, R13E, U.M.) were surveyed for nesting raptors by hiking, with ingress and egress provided by a helicopter.

One pair of rough-legged hawks and a single gyrfalcon were observed along Iteriak Creek (see results section for details).

RESULTS

Peregrine Falcons

The location and nesting success of all peregrine falcons observed are shown on Table 2. Of the 60 peregrine falcon young observed in NPR-A only 55 were old enough to be banded at the time of the survey. (See Appendix II.)

In 1982 peregrine falcons were present at 36 locations in NPR-A. Thirty-two locations had pairs, with singles present at the remaining four locations. The majority of peregrine falcons observed, 26 pairs and 3

singles, occurred along the Colville River between the mouth of the Etivluk River and Ocean Point. Eighteen of the 26 pairs were successful in producing young. These 18 pairs produced 48 young, an average of 1.85 young per total number of pairs. The remaining eight pairs (30%) failed to produce young.

No peregrine falcons were found on any of the historical nest locations that were checked on the Utukok River, the upper Colville River (above the Etivluk River), and Carbon Creek.

At the time of the writing of this report, four peregrine falcons banded during this project have been recovered. Three were trapped and released by Dr. Kenton Riddle at Padre Island, Texas. The fourth was found alive, but in an emaciated condition at Grays Harbor, Washington. The locations and dates of banding and recovery data of these four peregrines are shown on Table 3.

Gyrfalcons

The locations of all observed gyrfalcons in NPR-A are listed in Table 4. One of the three nestling gyrfalcons observed during 1982 was banded. (See Appendix II.)

Gyrfalcons were present at 16 locations in NPR-A. Twelve locations had pairs with singles present at the remaining four locations. Eight of the twelve pairs were known to have attempted nesting, with all eight occurring on the Colville River between the mouth of the Etivluk River and Ocean Point. Three of the eight nesting attempts were successful, producing one young per nest. The production for all gyrfalcons observed was .25 young per total number of pairs.

Rough-legged Hawks

The locations of all rough-legged hawks observed in NPR-A are included in Table 4. A total of thirty-four nestlings were banded (see Appendix II).

Rough-legged hawks were observed at 54 locations on the Colville River between the mouth of the Etivluk River and Ocean Point. There were 44 known nesting attempts of which 22 were successful. The 22 successful nests produced at least 39 young.

Of the 75 pairs observed in NPR-A (including the Colville River), 37 pairs were successful in producing at least 61 young. The fecundity of rough-legged hawks was .8 young per total number of pairs.

Ravens

Ravens, although not classified as a raptor, use very similar nesting habitat and prey species within NPR-A. During this survey, in addition to collecting data on all raptors observed, data was also collected on all ravens observed (see Table 4).

Four pairs of ravens were seen at bluffs on the Colville River between the mouth of the Etivluk River and Ocean Point. Two pairs had nests and produced a total of eight young. There was one additional pair observed on the Kogosukruk River but no nest was found. The fecundity of Ravens was 1.6 young per total number of pairs.

Other Data

A major objective of the 1982 raptor survey was to identify and photograph all cliffs along the main Colville River from the mouth of the Etivluk River to Ocean Point. In 1971 all cliffs along this stretch of the main Colville River were given a numerical designation #1 through #80 by C. M. White and T. J. Cade.

All cliffs #1 through #80 with the exception of #4, which could not be located, were photographed and plotted on maps during the first float trip June 15th-27th (see Appendix III). These maps and photographs are now cataloged and available for review at the Bureau of Land Management, Fairbanks District Office, Arctic Resource Area.

During the 1982 survey, all cliffs along the upper Colville River, between the Etivluk River upstream to the Nuka River, were assigned alphabetical designations (see Appendix III). These cliff designations, in conjunction with designations established by White and Cade in 1971, will help in identifying each specific cliff along the majority of the Colville River for future raptor surveys.

DISCUSSION

Peregrine Falcons

The productivity of peregrine falcons continued to show encouraging trends in 1982 (see Table 1). Although the population along the Colville River has still not recovered from its decline, several indicators showed a continuation towards recovery. There was a dramatic increase in the number of young produced per total pair from 1.29 in 1981 to 1.85 in 1982 (see Table 1). The number of young produced on the Colville increased from 31 in 1981 to 48 in 1982. There was an increase in the number of successful nests in 1982 over 1981 from 12 to 18, and a drop in the percentage of pairs which did not produce young from 50% in 1981 to 30% in 1982. For the purposes of discussion the nest at cliff 73 was considered a failure. This nest still contained eggs on July 28, which was several weeks behind the phenology at all other nests observed.

Any comparison of results of young produced to fledgling success for the 1982 survey should be viewed with the following considerations. Vegetation, mosquito emergence, and snow melt during 1982 occurred at least two weeks later than in 1981. The peregrine nesting cycle was behind the 1981 timetable (see Table 5). The larger broods were found upstream of Umiat with an average of 2.8 young per nest. Downstream from Umiat the average brood size was considerably less at 1.25 young per nest. Therefore, the nests with larger broods were checked earlier when the chicks were younger. Counting the chicks at an earlier age leaves longer periods of time before the counted birds fledged, thereby increasing the chances of mortality before fledging.

Although not investigated, the 1982 delayed phenology may have had a negative affect on the amount of prey available to recently fledged peregrines. A larger percentage of individuals of some prey species may not have bred during the late spring, and species which were on schedule may have migrated out of the area before the peregrines fledged.

The ratio of 1.85 young per pair in 1982 was the highest ever recorded on the Colville and was a large increase over last year. This productivity index was substantially higher than the 1.4 ratio considered normal for a healthy population of tundra peregrines according to the Alaska Peregrine Falcon Recovery Team. However, until a trend can be shown over the next several years, it should not be assumed that this high level of fecundity will continue.

Although the productivity within this peregrine population along the Colville River between the mouth of the Etivluk River and Nuiqsut has been increasing in recent years, there are indications that this population has not yet completely recovered. The number of adult peregrines present at nesting bluffs is still below historic numbers (see Figure 4). There was little increase in the number of adults from 1981 to 1982. In 1981 there were 24 pairs and 5 singles present at bluffs, and in 1982 there were 26 pairs and 3 singles, for a total of 53 adults in 1981 and 55 in 1982.

The gain of one pair and the increased percentage of successful nests among pairs present in 1982 are encouraging but 55 adults is well below the 80 adults (40 pairs) recorded in 1959.

In addition, it is discouraging that there was not a higher number of single birds present at bluffs in 1982. In an expanding population the number of single birds can be an encouraging sign. Two bluffs which had singles present in 1981 had pairs in 1982 and produced six young. Unfortunately the Colville River population with only three singles present between the mouth of the Etivluk River and Nuiqsut leaves little optimism for a dramatic increase in nesting pairs next year.

The portion of the Colville River upstream from the confluence of the Oolamnagavik River contained a low number of adult peregrines. Between the Etivluk River and Oolamnagavik River only three pairs and no singles were present. This was well below the eight pairs which were present in 1952 and represents no increase from 1981. The portion of the upper Colville River between 5 km. upstream from the confluence of the Nuka River and 3 km. upstream from the confluence of the Kaligwa River was surveyed in 1982 and found to have two adult females at one location and no pairs, although this stretch of river contained three historic nests.

Two historic nest sites near the confluence of the Ipnavik River and the Colville River which were last known active in 1977 were vacant in 1981 and 82. It is clear that the number of peregrines over much of the Colville River (between the Nuka and Oolamnagavik Rivers) is still well below previous numbers.

The trends seen on the upper Colville River may be indicative of the northwestern arctic in general. Three bluffs, on which historical

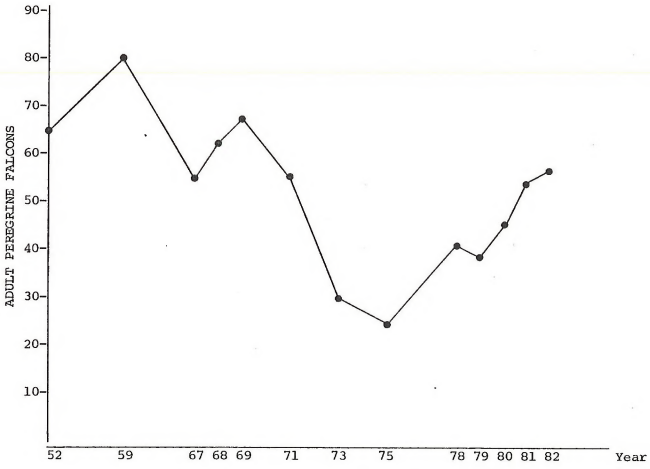

Figure 4. THE NUMBER OF ADULT PEREGRINE FALCONS SEEN ON THE COLVILLE RIVER

peregrine falcon nest sites occured were surveyed on the Utukok River. No peregrines were present on any of these bluffs. However, the Etivluk and Kogosukruk Rivers seem to have retained populations of nesting peregrines. About 30 km. of the lower Etivluk River were surveyed, and one peregrine nest with four young was found. This bluff had a pair in 1977 (White and Boyce, 1978).

Five separate sites on the Kogosukruk River were occupied by peregrines in 1981 and 1982, though no more than three were known occupied in either year. Two were occupied in 1981 that were vacant in 1982. It is possible that all five sites could have been occupied in 1981 but two were not checked.

On three occasions during this survey the investigators unknowingly approached peregrine falcon nests which were being incubated by the male. On all three occasions, the male abandoned the nest while the investigators were still a considerable distance away. The female was perched nearby each time, and appeared to be bothered by her mate's abandoning of the nest. At two of three nests, the female immediately went to the nest and began incubating, even though the male was engaged in nest defense behaviors. At the third nest, the female called and chased the male, displacing him off of three consecutive perches. She quieted down only after the male resumed incubation.

It appeared as though these three males had abandoned incubation for nest defense in response to a much less severe intrusion than that which would be required to get the female off the nest. In each case the female was present and made sure the nest was cared for. Do these observations imply that the male is less competent than the female at deciding when to incubate and when to defend the nest? That is still unknown. But, if so, nest disturbances when the female has left the vicinity of the nest may adversely affect success. As recreational use of the Colville River increases, the chance of disturbances during the female's absence will also increase.

Other Raptors and Ravens

Reproduction by gyrfalcons, rough-legged hawks, and ravens in NPR-A in 1982 showed reductions from levels seen in 1981. Gyrfalcon and rough-legged hawk nesting success is variable from year to year, and is correlated to abundance of preferred prey items. Gyrfalcon reproduction varies with ptarmigan population variations, and rough-legged hawk success is tied to microtine population cycles (White and Cade, 1971). Year to year weather fluctuations may also play a role in yearly variations in nesting success.

Production of gyrfalcon young along the Colville River between the mouth of the Etivluk River and Ocean Point was drastically lower in 1982 than it was in 1981. Sixteen pairs produced 10 successful nests containing 19 young in 1981, a ratio of 1.19 young per total number of pairs (Dittrick and Swem, 1981). In 1982, only 10 pairs were present on bluffs, and only 3 pairs succeeded in producing a total of 3 young.

This equates to .3 young per total pair. It can be seen that fewer adult gryfalcons were present this year, fewer pairs successfully nested, and those with successful nests raised fewer young per nest.

Cade (1960) reported variations in the number of gyrfalcon young in successful nests ranging from 1.3 to 3.0 young per nest. The Colville River had approximately 1.9 young per nest in 1981 but only 1.0 in 1982.

Of the 10 pairs of gryfalcons seen on bluffs on the Colville, five attempted nesting and failed. One nest contained at least one chick on June 16 that was (were) dead on July 19. Another nest had at least two live young on June 22, but by July 26 the nest was empty. The bluff and nest lacked the signs of recent use that are characteristic of a successful gyrfalcon eyrie and no gyrfalcons were present, indicating the young had perished rather than fledged.

Cade (1960) suggested that starvation is the "principal killing factor for gyrfalcons" and implied that it may cause young to weaken and/or die while still in the nest. Ptarmigan, the principal prey item of gyrfalcons, tend to vary in numbers from year to year. Low ptarmigan populations result in reduced gyrfalcon reproduction (White and Cade, 1971) and it could be theorized that the high failure rate and overall poor reproductive performance seen in 1982 was a result of reduced ptarmigan numbers. This is further substantiated by the fact that only four ptarmigan were seen along the Colville River in over four weeks of observations. Single gyrfalcons were seen on the Utukok River, the upper Colville River and Iteriak Creek. A pair was observed on both Carbon Creek and the Kogosukruk River. There were no active nest sites located.

Rough-legged hawk reproduction was lower in 1982 than in 1981. Fifty-four pairs were present on the Colville River between the mouth of the Etivluk River and Ocean Point. Twenty-two of these pairs successfully nested, with thirty-nine young produced. This represents a large reduction from 1981, when 79 pairs had 46 successful nests containing at least 91 young. Production fell from 1.15 young per total number of pairs in 1981 to .75 young per total number of pairs in 1982 which is a drop of 32%.

Ravens were less abundant in 1982. Five pairs nested on the Colville River between the mouth of the Etivluk River and Ocean Point in 1981, but only two pairs nested in the same stretch in 1982. Two pairs were observed in flight near cliffs which had raven nests in 1981, but there were no active nests found on these two bluffs in 1982.

RECOMMENDATIONS

Because oil and gas exploration and development activities are on the increase over much of NPR-A, surveys to identify new raptor nest sites and monitor existing sites should be continued.

Due to the size of NPR-A (23 million acres), and the limited field season (June 1 to August 1) only a portion of the area can be surveyed

during anyone year. However, knowledge of the areas used historically and potentially available habitat narrows the size of the area requiring survey.

The Colville River is the core area for the peregrine falcon population within NPR-A, and should be monitored each year. Due to funding and time constraints many of the other rivers can only be surveyed periodically to determine their nesting population.

The following areas in order of priority should be surveyed during 1983 field season.

1. Main Colville River (Etivluk River to Ocean Point).
2. Utukok River (Driftwood to coast).
3. Carbon Creek (T2S, R30W, U.M. to Utukok River).
4. Upper Colville River (Nuka River to Etivluk River).

During future years (1984 and 1985), in addition to the monitoring of the main Colville River, the following rivers should be surveyed to the greatest extent possible.

1984	1985
1. Etivluk River	1. Kiligwa River
2. Ipnavik River	2. Nuka River
3. Kuna River	3. Colville (above Nuka River)

All surveys can use fixed-wing access, with rafts and hiking as the mode of ground transportation.

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APPENDIX I

TABLES 1-5

Table 1. Comparison of Peregrine Falcon (Falco peregrinus tundrius) productivity along the Colville River, Alaska (Etivluk River to Ocean Point, 1982.

Year	1952[1]	1959[1]	1967[1]	1968[1]	1969[1]	1971[1]	1973[1]	1975[1]	1978[2]	1979[3]	1980[4]	1981[5]	1982
Total # of Pairs	32	40	27	31	33	25	14	10	15	16	21	24	26
Lone Adults				1		6	1	3	9	5	2	5	3
# of Pairs with Young			18	16	13	9	4		8	6	12	12	18
# of Young Observed			34	34	26	14	9		14	15	29	31	48
Young per Total Pair			1.26	1.10	0.79	0.56	0.64		0.93	0.94	1.38	1.29	1.85

[1] White and Cade (1975)

[2] Todd (1978)

[3] Springer, et al, (1979)

[4] Ambrose (1980)

[5] Dittrick and Swem (1981)

Table 2. Peregrine Falcons (Falco peregrinus tundrius) observed along the Colville, and other selected rivers within NPR-A, 1982.

Cliff #	Adults	Nest Attempt	Young	Remarks
Upper Colville[1]				
M	2	?	0	Both birds were female
Main Colville[2]				
1	Located 3 miles up the Etivluk River-included in the Etivluk River data.			
8	2	Yes	3	
11	2	Yes	2	
40	2	Yes	4	
44	2	Yes	4	
46	2	yes	3	
48	2	yes	3	
52	2	Yes	2	
53	1(2)	Yes	0	
54	2	Yes	4	
58	2	Yes	2	
59A	2	?	0	
59A	2	?	0	
60	2	Yes	0	
61	2	Yes	1	
63	1	No	-	
63	2	?	0	
64	2	Yes	2	
65	2	?	0	
68A	2	Yes	4	
68B	2	Yes	1	
69A	2	Yes	2	
71	2	Yes	2	
73	2	Yes	?	3 eggs 28 July.
74	1	No	-	

Continued

Table 2. - Continued

Cliff #	Adults	Nest Attempt	Young	Remarks
74	1(2)	Yes	0	
77	1	No	-	
78	2	Yes	3	
79	2	Yes	3	
Etivluk River T.7S. R.18W. U.M.	2	Yes	4	
Etivluk River Cliff #1	2	Yes	3	3 miles up the Etivluk R. from the confluence with the Colville R.
Killik River	2	Yes	3	First bluff up the Killik R. from the confluence with the Colville R.
Kogosukruk River T.5N. R.2E. U.M. Sec. 30	2	Yes	4	
Kogosukruk River T.6N. R.2E. U.M. Sec. 10	2	?	0	Adults not defensive
Kogosukruk River T.6N. R.2E. Sec. 3	2	Yes	1	
Kikiakrorak River T.7N. R.2E. U.M. Sec. 18	2	?	0	

[1] Cliff designations (Alphabetical) on the upper Colville River (Nuka River to the Etivluk River) established during the 1982 survey.

[2] Cliff designations (Numerical) on the main Colville River (Etivluk River to Ocean Point) taken from White and Cade (1971).

Table 3. Peregrine Falcons (Falco peregrinus tundrius) Recovery data of young birds banded during 1982.

Banded		Recovered	
Date	Location	Date	Location
16 July	Etivluk River	11 October	Padre Island, Texas
22 July	Colville Cliff #48	29 September	Padre Island, Texas
27 July	Kogosukruk River	15 October	Padre Island, Texas
28 July	Colville Cliff #79	27 October	Grays Harbor, Wash.

Table 4. Raptors, except Peregrine Falcons, observed along the Colville and other selected rivers within NPR-A, 1982.

Cliff # Locations	Species[1]	Adults[2]	Nesting[3] Attempt	Young[4]	Young Banded
Upper Colville River[5] Nuka R. to Etivluk R.					
A	RL	1(2)	Yes	?(Yes)	
L	RL	2	Yes	2	Yes
M	RL	2	?		
N	RL	1(2)	Yes	?(Yes)	
O	RL	2	Yes	Yes	No
Q	RL	2	Yes	Yes	No
	G	1	?	0	
R	RL	2	Yes	1	Yes
U	RL	2	Yes	?(Yes)	
V	RL	2	Yes	?(Yes)	
X	RL	2	Yes	1	Yes
Y	RL	2	Yes	2	No
Z	RL	2	Yes	3	Yes
Main Colville River[6] Etivluk R. to Ocean Point					
1	Data included under Etivluk River				
5	G	1(2)	Yes	0	
7	RL	2	Yes	?	
	G	1	?		
8	RL	2	Yes	2	Yes
	RL	2	Yes	2	Yes
9	RL	2	Yes	0	
	RL	2	Yes	?	
10	RL	2	Yes	2	Yes
11	RL	1(2)	Yes	0	
	RL	2	Yes	0	
12	G	1(2)	Yes	1	No
13	R	2	?	0	
14	RL	2	Yes	2	Yes

Continued

Table 4. - Continued

Cliff # Locations	Species	Adults	Nesting Attempt	Young	Young Banded
15	RL	2	Yes	1	Yes
17	RL	1	?	0	
19	RL	1(2)	Yes	1	No
20	G	2	Yes	0	
	RL	1(2)	Yes	0	
26	RL	2	Yes	2	Yes
	G	2	?	?	
28	G	1(2)	Yes	0	
29	RL	1(2)	Yes	1	No
32	R	1	?	0	
33	RL	1	?	0	
36	RL	2	Yes	1	No
38	RL	1(2)	Yes	0	
40	RL	1(2)	Yes	2	Yes
41	RL	2	Yes	?(Yes)	
43	RL	2	Yes	1	Yes
44	RL	2	Yes	0	
45	RL	1	?	0	
46	RL	2	Yes	1	Yes
48	G	1(2)	Yes	1	Yes
50	RL	1(2)	Yes	0	
51	RL	2	Yes	3	No
52	RL	1(2)	Yes	0	
	RL	1(2)	Yes	0	
58	RL	2	?	0	
	RL	1	?	0	
	R	2	Yes	4	No
59A	RL	2	Yes	2	No
	RL	2	?		
	RL	2	Yes	2	No
	RL	2	Yes	0	

Continued

Table 4. - Continued

Cliff # Locations	Species	Adults	Nesting Attempt	Young	Young Banded
59B	RL	1(2)	Yes	0	
	G	2	?	0	
	RL	2	Yes	0	
60	G	2	Yes	1	No
	RL	2	Yes	0	
61	G	2	Yes	0	
63	R	(2)	Yes	4	No
	RL	1(2)	Yes	0	
	G	1(2)	Yes	0	
64	RL	2	?	0	
	RL	2	?	0	
64-65	RL	2	Yes	?	
66	RL	2	?	0	
68B	G	1	?	0	
69A	RL	1(2)	Yes	0	
69B	RL	2	Yes	2	No
73	RL	2	Yes	NC	
75	RL	2	Yes	0	
77	RL	2	Yes	1	Yes
	RL	2	?	0	
	RL	2	Yes	2	Yes
79	RL	2	Yes	0	
	RL	2	Yes	1	Yes
Lower Etivluk River					
T.9S. R.19W. U.M. Sec. 12	RL	2	Yes	NC	
T.7S. R.18W. U.M. Sec. 11 SW¼	RL	1	?	0	
Sec. 11 NW¼	RL	2	Yes	2	Yes
T.6S. R.18W. U.M. Sec. 35	RL	1(2)	Yes	NC	
Colville River cliff #1	RL	2	Yes	3	Yes
	RL	2	Yes	4	3/4

Continued

Table 4. - Continued

Cliff # Locations	Species	Adults	Nesting Attempt	Young	Young Banded
Fork of Kogosukruk River					
T.2N. R.1W. U.M.					
Sec. 18	RL	2	?	0	
T.3N. R.1W. U.M.					
Sec. 32	RL	2	Yes	2	Yes
Kogosukruk River					
T.3N. R.1W. U.M.					
Sec. 14	RL	1	?	0	
Sec. 21	G	2	?	0	
	RL	2	?	0	
Sec. 22 NE¼	RL	1	?	0	
Sec. 22 SW¼	RL	2	Yes	Yes	No
Sec. 28	RL	2	?	0	
T.3N. R.1E. U.M.					
Sec. 8	RL	1	?	0	
T.5N. R.2E. U.M.					
Sec. 17	RL	1	?	0	
Sec. 21	R	2	?	0	
T.6N. R.2E. U.M.					
Sec. 10	RL	2	?	?	
Sec. 22	RL	1	?	0	
T.7N. R.2E. U.M.					
Sec. 34	RL	2	Yes	?	
Kikiakrorak River					
T.7N. R.2E. U.M.					
Sec. 9	RL	1(2)	Yes	NC	
Otuk Creek					
T.11S. R.16W. U.M.					
Sec. 20	RL	1	?	0	
Carbon Creek					
T.2S. R.32W. U.M.					
Sec. 1 NE¼	RL	2	?	0	
Sec. 1 SW¼	G	2	?	0	

Continued

Table 4. - Continued

Cliff # Locations	Species	Adults	Nesting Attempt	Young	Young Banded
Utokok River					
T.2S. R.34W. U.M. Sec. 31	G	1	?	0	
T.3S. R.36W. U.M. Sec. 20	GE	1	?	?	
Iteriak Creek					
T.10S. R.13E. U.M. Sec. 21-22	G	1	?	0	
	RL	2	Yes	2	No

[1]Species abbreviations:
RL--rough-legged hawk (Buteo lagopus)
G---gyrfalcon (Falco rusticolus)
R---raven (Corvus corax)
GE--golden eagle (Aquila chrysaetos)

[2]Adults-number of adults observed. Number in paranthesis is number of adults implied, Ex.- 1(2) denotes one adult observed, but the presence of young implies that a second adult was temporarily absent at the time of observation.

[3]Nesting attempt:
Yes-eggs, young, or incubating adult was seen.
?---Nesting attempt never verified.

[4]Young:
Yes-young seen but a count not possible.
?---young not seen but implied by incubating adult observed on the nest after 7 July.
NC--Not checked.

[5]Cliff designations on the upper Colville River (Nuka River to the Etivluk River) established during the 1982 survey.

[6]Cliff designations on the main Colville River (Etivluk River to Ocean Point) taken from White and Cade (1971).

Table 5. Nesting Phenology of Peregrine Falcons (Falco peregrinus tundrius) on the Colville, Etivluk, Killik, and Kogosukruk[1] Rivers, Alaska, 1982.

Event	Mean Date		Range	
	1981[2]	1982[3]	1981	1982
Begin egg laying[4]	23 May	28 May	16 May-27 May	18 May-07 June
Hatching	25 June	30 June	18 June-29 June	20 June-10 July
Fledging	4 Aug.	9 Aug.	28 July-8 Aug.	31 July-19 Aug.

[1]The 1982 data excludes one pair which had no nest on 26 June, but was incubating 3 eggs on 28 July. There was no way to determine egg laying date.

[2]Dates were determined by back-dating from observations of chicks of estimated age: n=33, x=24.6 days, s.d.=3.52 on 20 July. Mean time intervals used in these calculations are 34 days for incubation, and 40 days as nestlings. (Dittrict and Swem, 1981).

[3]Dates were determined by back dating from observations of chicks of estimated age: n=60, x=20.8, s.d.=5.17 on 20 July. Mean time intervals used in these calculations are 34 days for incubation and 40 days as nestlings.

[4]Incubating begins with the first egg layed in arctic populations (Ambrose, in memorandum to contractors for raptor surveys June 1, 1981).

APPENDIX II

BANDING DATA

Peregrine Falcons (Falco peregrinus tundrius) banded on the Colville River and its tributaries, Alaska, 1982.

Location	Band #	Date
Etivluk River	987-30539	16 July
	987-30540	16 July
	987-30541	16 July
	987-30542	16 July
Colville River[1]		
#1	987-30543	17 July
	987-30544	17 July
	987-30545	17 July
#11	987-30546	18 July
	987-30547	18 July
#40	987-30548	21 July
	987-30549	21 July
#44	987-30550	21 July
	987-30551	21 July
	987-30552	21 July
	987-30553	21 July
Killik River	987-30554	21 July
	987-30555	21 July
	987-30556	21 July
#46	987-30557	22 July
	987-30558	22 July
	987-30559	22 July
#48	987-30560	22 July
	987-30561	22 July
	987-30562	22 July
#52	987-30563	23 July
	987-30564	23 July
#54	987-30565	23 July
	987-30566	23 July
	987-30567	23 July
	816-46601	23 July
#58	987-30568	25 July
	987-30569	25 July

Continued

Peregrine Falcons. - Continued

Location	Band #	Date
#61	816-46602	26 July
#64	987-30570	26 July
	987-30571	26 July
#68A	987-30572	26 July
	987-30573	26 July
	816-46603	26 July
	816-46604	26 July
#68B	816-46605	27 July
#69A	816-46606	27 July
	987-30574	27 July
Kogosukruk River	987-30575	27 July
	987-30576	27 July
	987-30577	27 July
	816-46607	27 July
	987-30578	27 July
#71	987-30579	27 July
	987-30580	27 July
#78	987-30581	28 July
	987-30582	28 July
	816-46608	28 July
#79	816-46609	28 July
	987-30583	28 July
	987-30584	28 July

[1]Cliff numbers taken from White and Cade (1971)

Raptors, except Peregrine falcons, banded on the Colville River and its tributaries, Alaska, 1982.

Species[1]	Location	Band #	Date
	Upper Colville River[2]		
RL		877-77013	14 July
RL		877-77014	14 July
RL		877-77015	14 July
RL		877-77016	14 July
RL		877-77017	14 July
RL		877-77018	15 July
RL		877-77019	15 July
RL	Etivluk River	877-77020	17 July
RL		877-77021	17 July
	Colville River[3]		
RL	#1	877-77022	17 July
RL		877-77023	17 July
RL		877-77024	17 July
RL		877-77025	17 July
RL		877-77026	17 July
RL		877-77027	17 July
RL	#8	877-77028	17 July
RL		877-77029	17 July
RL		877-77030	17 July
RL		877-77031	17 July
RL	#10	877-77032	18 July
RL		877-77033	18 July
RL	#14	877-77034	18 July
RL		877-77035	18 July
RL	#15	877-77036	19 July
RL	#26	877-77037	19 July
RL		877-77038	19 July
RL	#40	877-77039	22 July
RL		877-77040	22 July
RL	#43	877-77041	22 July
RL	#46	877-77042	22 July
G	#48	877-77043	22 July

Continued

Raptors, except Peregrine Falcons. - Continued

Species	Location	Band #	Date
RL	#77	877-77044	28 July
RL		877-77045	28 July
RL		877-77046	28 July
RL	#79	877-77047	28 July

[1]RL - rough-legged hawk (Buteo lagopus)
G--- gyrfalcon (Falco rusticolus)

[2]Cliff designations on the upper Colville River (Nuka River to the Etivluk River) established during the 1982 survey.

[3]Cliff designations on the main Colville River (Etivluk River to Ocean Point) taken from White and Cade (1971).

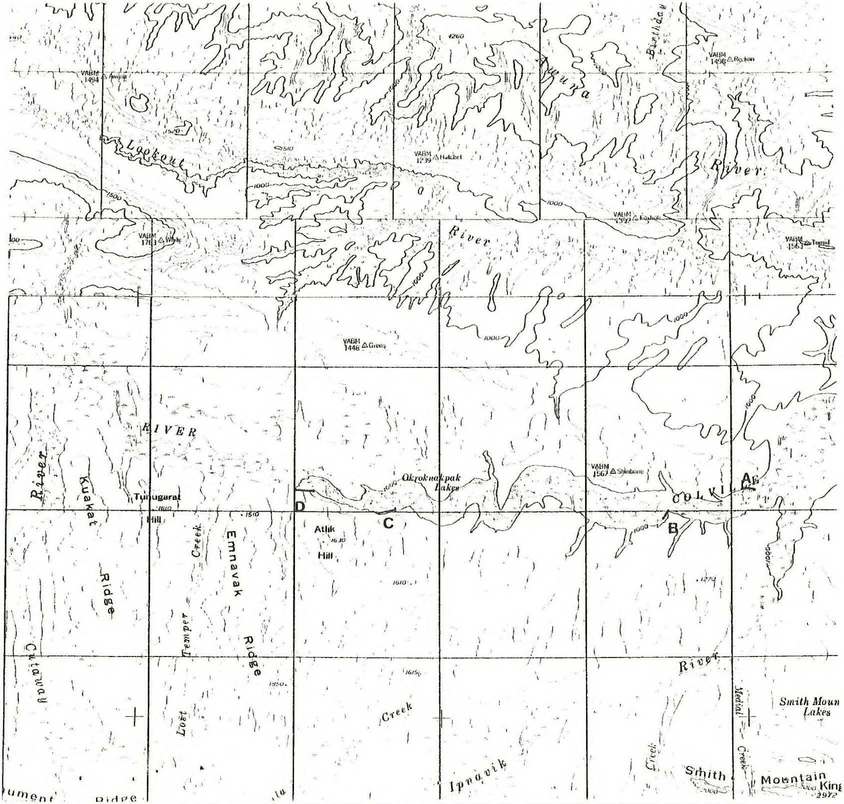
APPENDIX III

MAPS

MAP INDEX

Cliff designations (Alphabetical) on the upper Colville River (Etivluk River to the Nuka River) established during the 1982 survey.

Cliff designations (Numerical) on the main Colville River (Etivluk River to Ocean Point) taken from White and Cade (1971).



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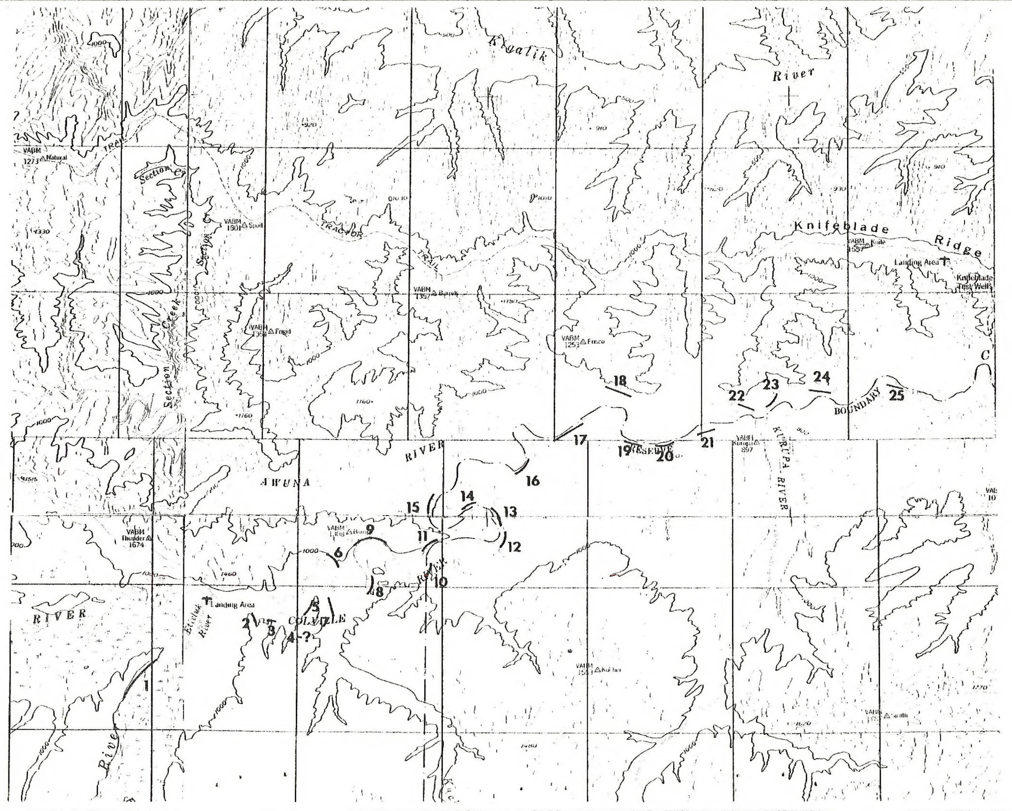
VABM 1494
1520
Lookout
1510
1000
VABM 1239 Hatchet
River
1500
1000
VABM 1703 White
River
VABM 1448 Green
RIVER
River
Kuakat
Ridge
Tunugarat
1610
Hill
Creek
Temper
Lost
Emnavak
Ridge
1510
D
Atlik
1630
Hill
C
Okroknakpak
Lakes
VABM 1567 Shinbone
COLVILLE
A
B
1000
1610
1270
Cutaway
Ridge
River
1615
1950
Creek
Ipnavik
Medial
Creek
Smith Mountain Lakes
Smith
Mountain
2972

VABM 1415 △ Bon
Carbon
Creek
VABM 1541 △ Jim
1250
1300
1220
VABM 1230 △ Mike
VABM 1054 △ Al
Awuna
River
1000
1360
VABM 1297 △ Last
VABM 1395 △ Gradin
TRACTOR
VABM 1972 △ Dal
1500
1640
LOOKOUT
RIDGE
VABM 1852 △ Rex
VABM 1743 △ Roost
Grayling
1680
TRAIL
1840
Creek
1720
Z
Y
X
W
Colville
Naka R
U
T
V
S
R
River
Q
q
O
N
M
L
K
J
P
1300
1370
Killigwa R
Naka River
Colville
Creek
Brady
Kiligwa
River
Creek
I
VABM 1339 △ Bob
F
VABM 1300 △ Pal
COLVILLE
H
G
E
Mitten
VABM 1982 △ Nuka
VABM 1873 △ Brady
Liberator
1630
Etigonik
Mountain
1840
VABM 1909 △ Kill
2080
1610
Liberator Lake
2000
2245
2145
Migrant
Creek
Creek
2000
VABM △ 2070
1580


Kigalik
River
Knifeblade
Ridge
VABM 1557 △ Knife
Landing Area
Knifeblade Test Wells
VABM 1273 △ Natural
TRAIL
Section Cr
Section Cr
Section Creek
Section Cr
VABM 1901 △ Spoil
TRACTOR
TRAIL
VABM 1357 △ Barrels
VABM 1354 △ Frigid
VABM 1253 △ Fresco
BOUNDARY
RESERVE
KURUPA RIVER
RIVER
AWUNA
VABM Thunder △ 1674
Landing Area
COLVILLE
RIVER
RIVER
River
1
2
3
4-?
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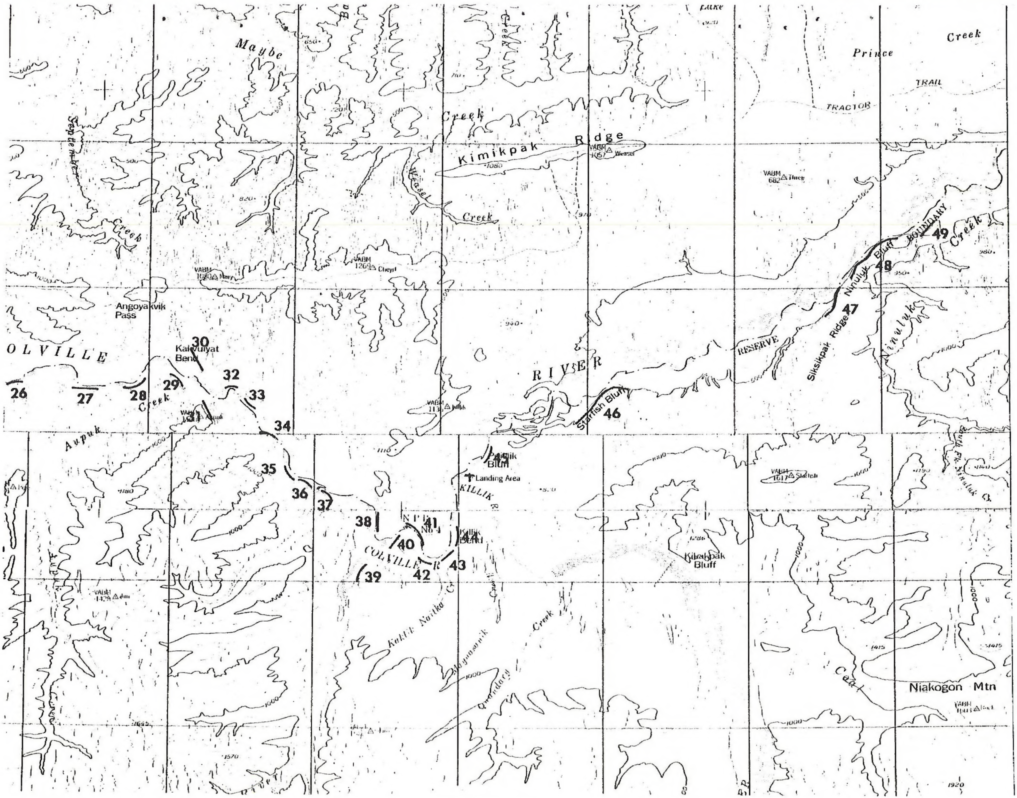

Maybe
Prince
Creek
TRAIL
TRACTOR
Creek
Kimikpak
Ridge
VABM 1057 Weasel
VABM 682 Three
Weasel
Creek
BOUNDARY
49
Creek
48
Ninuluk Bluff
47
Siksikpak Ridge
Ninuluk
RESERVE
Angoyakvik Pass
OLVILLE
30
Kaiyuliyat Bend
32
33
34
26
27
28
29
Creek
RIVER
Starfish Bluff
46
Aupuk
35
36
37
38
41
40
39
42
43
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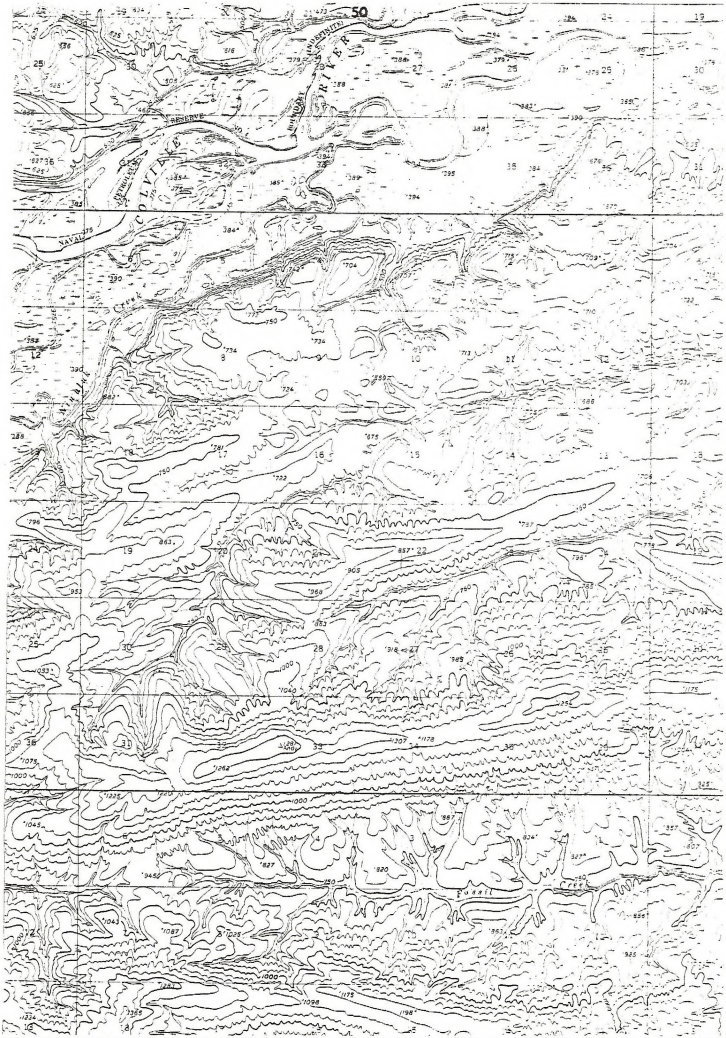
Killik Bend
COLVILLE R
Bluff
Landing Area
KILLIK R
VABM 1617 Starfish
Kikiakpak Bluff
Creek
Niakogon Mtn
Coal


OLYMPIC
NATIONAL
FOREST
Quinault River
Duckabush River
Hamma Hamma River
Lake Cushman
Skokomish River
Olympic Hot Springs
Olympic Hot Springs Trail
Elwha River
Elwha Trail
Boulder Creek
Boulder Creek Trail
Lake Mills
Lake Crescent
Lake Sutherland
Sutherland Peak
Mount Angeles
Mount Storm King
Mount Carrie
Mount Walker
Mount Townsend
Mount Constance
Mount Deception
Mount Ellinor
Mount Skokomish
Mount Olympus
Mount Anderson
Mount Meany
Mount Queets
Mount Seattle
Mount Noyes
Mount Fitzhugh
Mount Fromme
Mount Ferry
Mount Cruiser
Mount Barnes
Mount Christie
Mount Tom
Mount Jupiter
Mount Venus
Mount Mercury
Mount Saturn
Mount Neptune
Mount Pluto
Mount Uranus
Mount Mars
Mount Pan
Mount Apollo
Mount Diana
Mount Vulcan
Mount Minerva
Mount Juno
Mount Ceres
Mount Vesta
Mount Pallas
Mount Hestia
Mount Hebe
Mount Iris
Mount Flora
Mount Metis
Mount Hygeia
Mount Parthenia
Mount Victoria
Mount Egeria
Mount Irene
Mount Eunomia
Mount Psyche
Mount Thetis
Mount Melpomene
Mount Fortuna
Mount Massalia
Mount Lutetia
Mount Calliope
Mount Thalia
Mount Themis
Mount Phocaea
Mount Proserpina
Mount Euterpe
Mount Bellona
Mount Amphitrite
Mount Urania
Mount Euphrosyne
Mount Pomona
Mount Polyhymnia
Mount Circe
Mount Leucothea
Mount Atalante
Mount Fidelio
Mount Lydia
Mount Manto
Mount Daphne
Mount Eurydice
Mount Freia
Mount Eugenia
Mount Hestia
Mount Aglaja
Mount Doris
Mount Pales
Mount Virginia
Mount Nemausa
Mount Europa
Mount Calypso
Mount Alexandra
Mount Pandora
Mount Melete
Mount Mnemosyne
Mount Concordia
Mount Elpis
Mount Leto
Mount Thyra
Mount Hertha
Mount Sylvia
Mount Thisbe
Mount Julia
Mount Antiope
Mount Aurora
Mount Diotima
Mount Chloris
Mount Hecate
Mount Helena
Mount Miriam
Mount Hera
Mount Clio
Mount Dorothea
Mount Cybele
Mount Hekate
Mount Emma
Mount Lucina
Mount Alkmene
Mount Joan
Mount Carlotta
Mount Dembowska
Mount Roxande
Mount Felicitas
Mount Lachesis
Mount Tuttle
Mount Taurinensis
Mount Feronia
Mount Krumbia
Mount Kerberos
Mount Siegena
Mount Theobalda
Mount Philosophia
Mount Eukrate
Mount Hermione
Mount Aeolia
Mount Sarpedon
Mount Thalia
Mount Terpsichore
Mount Alkmene
Mount Beatrix
Mount Clio
Mount Dorothea
Mount Ekard
Mount Hekate
Mount Hera
Mount Lucina
Mount Olympia
Mount Pallas
Mount Pandora
Mount Sylvia
Mount Thisbe
Mount Ursula
Mount Vera
Mount Walpurga
Mount Zelia
Mount Zerlina
Mount Zwetana
Mount Adeona
Mount Agrippina
Mount Alauda
Mount Amalthea
Mount Amazonia
Mount Ampella
Mount Anahita
Mount Andromache
Mount Angelina
Mount Anna
Mount Antigone
Mount Antonia
Mount Arachne
Mount Aretaa
Mount Ariadne
Mount Arianna
Mount Arsinoe
Mount Artemis
Mount Asporina
Mount Astrid
Mount Athamantis
Mount Atropos
Mount Aurelia
Mount Aurora
Mount Bamberga
Mount Barbara
Mount Beatrix
Mount Bellona
Mount Berenike
Mount Bertha
Mount Bianca
Mount Boreas
Mount Brasilia
Mount Brigitta
Mount Britannia
Mount Calliope
Mount Calypso
Mount Camilla
Mount Canopus
Mount Capella
Mount Carlotta
Mount Carmen
Mount Cassandra
Mount Castalia
Mount Ceres
Mount Chaldaea
Mount Chloris
Mount Cleopatra
Mount Clio
Mount Clotho
Mount Colchis
Mount Concordia
Mount Cybele
Mount Daedalus
Mount Daphne
Mount Dembowska
Mount Diana
Mount Dido
Mount Diotima
Mount Dorothea
Mount Doris
Mount Echo
Mount Egeria
Mount Eichsfeldia
Mount Elektra
Mount Elpis
Mount Elsa
Mount Emma
Mount Erato
Mount Erda
Mount Erigone
Mount Eros
Mount Eugenia
Mount Eukrate
Mount Europa
Mount Eurydice
Mount Euterpe
Mount Fama
Mount Fidelio
Mount Flora
Mount Fortuna
Mount Freia
Mount Gaea
Mount Galatea
Mount Gefion
Mount Gerda
Mount Germania
Mount Gerstrud
Mount Gisela
Mount Gladys
Mount Glauke
Mount Gudrun
Mount Gunlod
Mount Hamburga
Mount Harmonia
Mount Hebe
Mount Hecate
Mount Hedwig
Mount Hekate
Mount Helena
Mount Hera
Mount Hermione
Mount Herta
Mount Hertha
Mount Hestia
Mount Hilda
Mount Hippodamia
Mount Hungaria
Mount Hygeia
Mount Iduna
Mount Ilmatar
Mount Imbria
Mount Interamnia
Mount Io
Mount Iphigenia
Mount Iris
Mount Irma
Mount Isabella
Mount Isis
Mount Ismene
Mount Istria
Mount Ivanka
Mount Jacqueline
Mount Jamagata
Mount Janina
Mount Jason
Mount Jenny
Mount Jetta
Mount Joan
Mount Johanna
Mount Josefa
Mount Juewa
Mount Julia
Mount Juno
Mount Kalliope
Mount Kalypso
Mount Karin
Mount Kassandra
Mount Kastalia
Mount Kathleen
Mount Kerberos
Mount Kirsten
Mount Klio
Mount Koronis
Mount Kreusa
Mount Krumbia
Mount Kundry
Mount Kybele
Mount Lachesis
Mount Lamberta
Mount Lamia
Mount Laodamia
Mount Larissa
Mount Lauretta
Mount Leda
Mount Lehigh
Mount Leonora
Mount Leto
Mount Leucothea
Mount Libussa
Mount Lilaea
Mount Lilith
Mount Lindemannia
Mount Lioba
Mount Lipperta
Mount Lisa
Mount Lomia
Mount Lorelei
Mount Lucia
Mount Lucina
Mount Ludmilla
Mount Lumen
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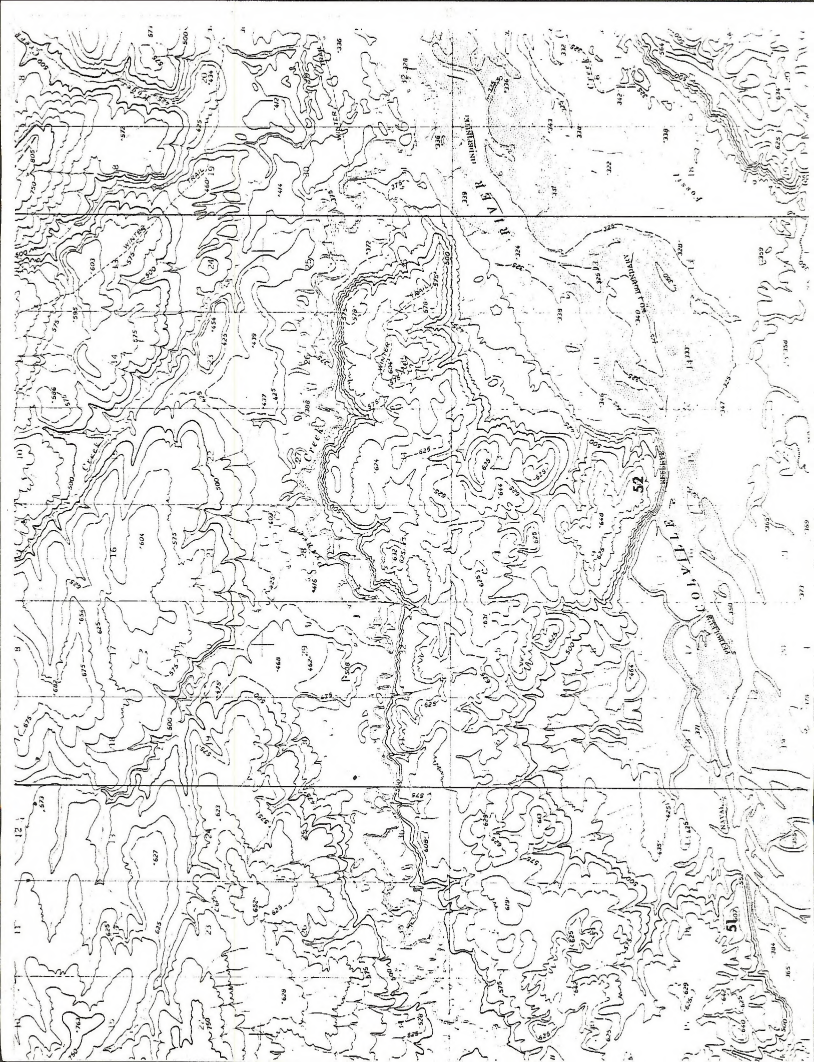
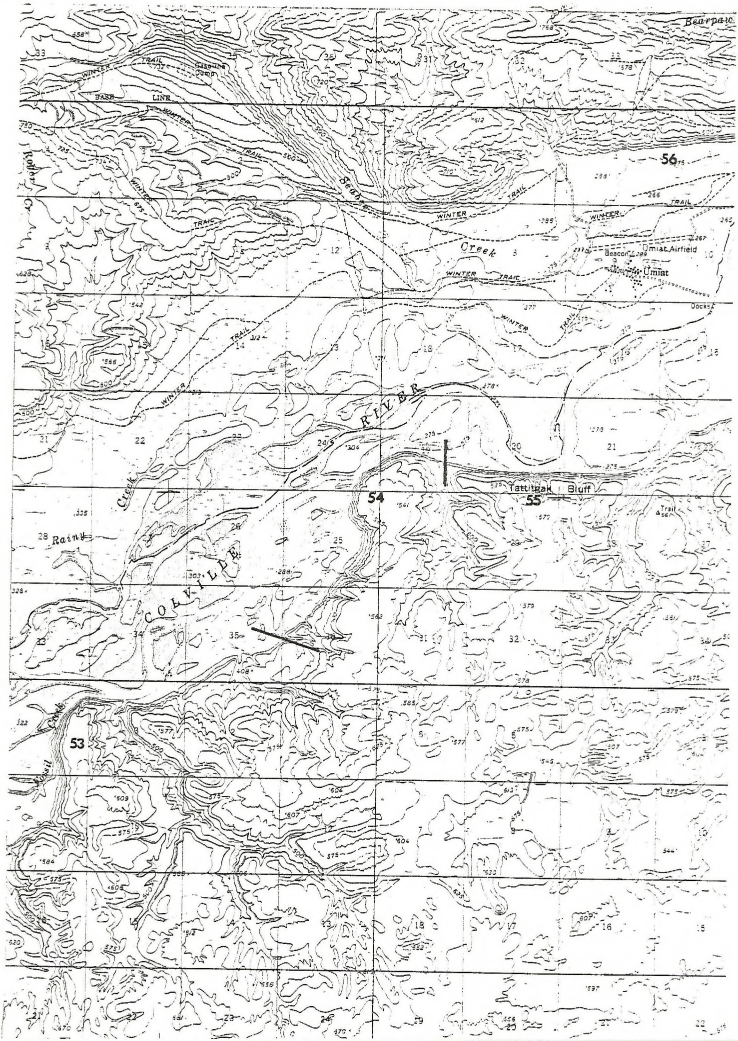
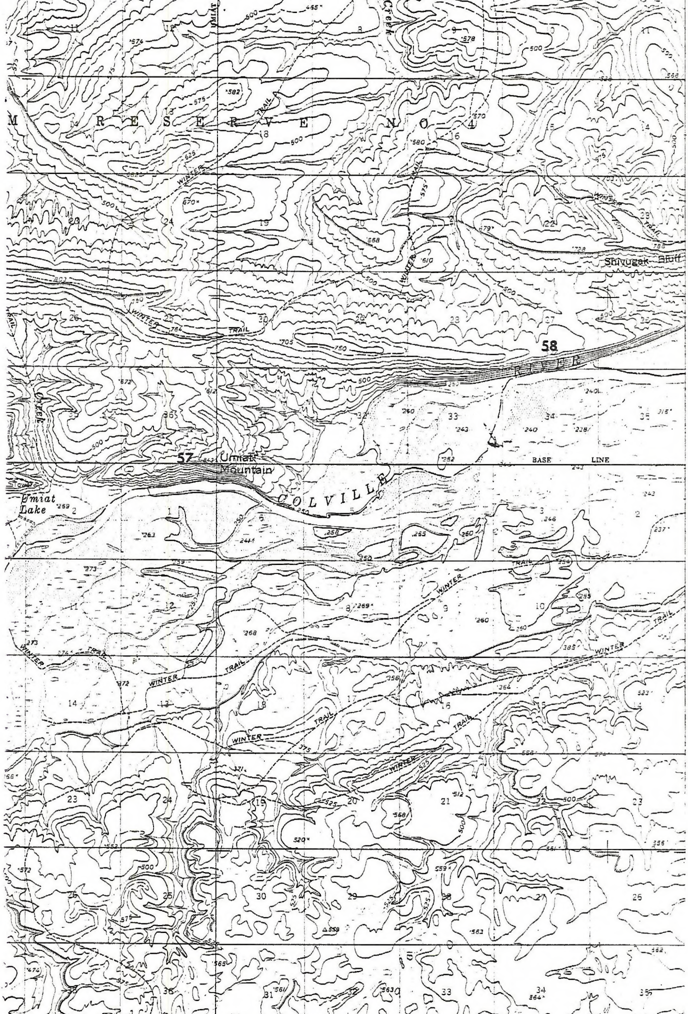
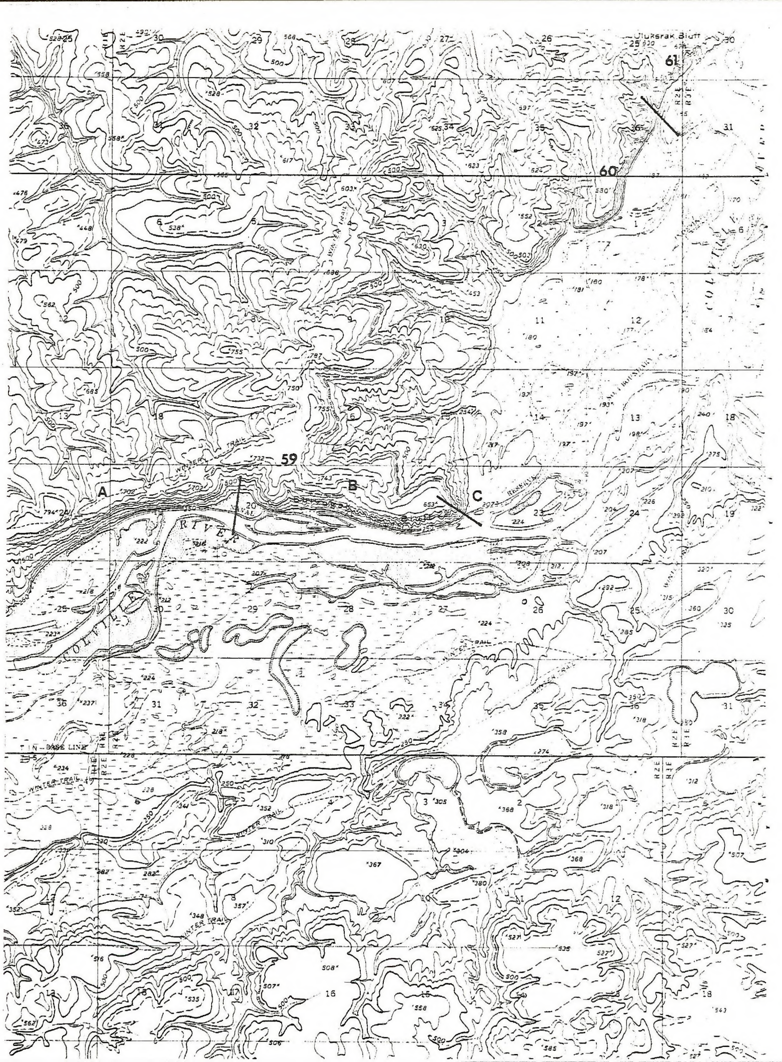
Mount Malabar
Mount Malvina
Mount Manto
Mount Marconia
Mount Margarita
Mount Maria
Mount Marie
Mount Marion
Mount Massalia
Mount Mathilde
Mount Maud
Mount Medusa
Mount Melanie
Mount Melete
Mount Melpomene
Mount Menippe
Mount Merapi
Mount Merope
Mount Metis
Mount Mimi
Mount Minerva
Mount Miriam
Mount Mnemosyne
Mount Mona
Mount Monica
Mount Monika
Mount Nausikaa
Mount Nemausa
Mount Nenetta
Mount Nephele
Mount Nerthus
Mount Nicolaia
Mount Nike
Mount Niobe
Mount Nolda
Mount Nora
Mount Norma
Mount Nuwa
Mount Nysa
Mount Oceana
Mount Odessa
Mount Oenone
Mount Olga
Mount Olympia
Mount Omega
Mount Ondina
Mount Oppavia
Mount Orpheus
Mount Ottilia
Mount Pales
Mount Pallas
Mount Pandora
Mount Papagena
Mount Parthenia
Mount Patricia
Mount Paula
Mount Pauline
Mount Penelope
Mount Perpetua
Mount Petrina
Mount Phaetusa
Mount Phaia
Mount Philosophia
Mount Phocaea
Mount Phyllis
Mount Pia
Mount Pierre
Mount Pilar
Mount Pirola
Mount Pisa
Mount Pitha
Mount Polana
Mount Polyhymnia
Mount Pomona
Mount Porrima
Mount Portlandia
Mount Prokne
Mount Proserpina
Mount Psyche
Mount Purkinje
Mount Quantum
Mount Quasimodo
Mount Quetzal
Mount Quirinia
Mount Radegunda
Mount Rafaela
Mount Ramona
Mount Rarahu
Mount Regina
Mount Rhea
Mount Rhodia
Mount Rita
Mount Roberta
Mount Rosa
Mount Rosamunde
Mount Rosina
Mount Roxande
Mount Rudolphina
Mount Sabine
Mount Sabrina
Mount Salacia
Mount Salome
Mount Sappho
Mount Sarpedon
Mount Scylla
Mount Seraphina
Mount Sibylla
Mount Sidonia
Mount Silesia
Mount Sirona
Mount Sonia
Mount Sophia
Mount Sophrosyne
Mount Stephania
Mount Stereoskopia
Mount Suzanne
Mount Sylvia
Mount Tamara
Mount Tanete
Mount Tanina
Mount Tauris
Mount Taurinensis
Mount Tecmessa
Mount Teichmannia
Mount Telamonia
Mount Tempel
Mount Terpsichore
Mount Tetyana
Mount Thalia
Mount Thea
Mount Themis
Mount Theobalda
Mount Thetis
Mount Thisbe
Mount Thora
Mount Thorvaldsena
Mount Thyra
Mount Tilia
Mount Titania
Mount Tolosa
Mount Tove
Mount Transvaalia
Mount Trinidad
Mount Tuttle
Mount Undina
Mount Ursula
Mount Vera
Mount Verona
Mount Vesta
Mount Veverka
Mount Victoria
Mount Vilma
Mount Virginia
Mount Vivian
Mount Walpurga
Mount Wanda
Mount Wellmannia
Mount Wendelina
Mount Wilhelmina
Mount Witt
Mount Xanthe
Mount Xenia
Mount Yerkes
Mount Yvonne
Mount Zelia
Mount Zerlina
Mount Zwetana

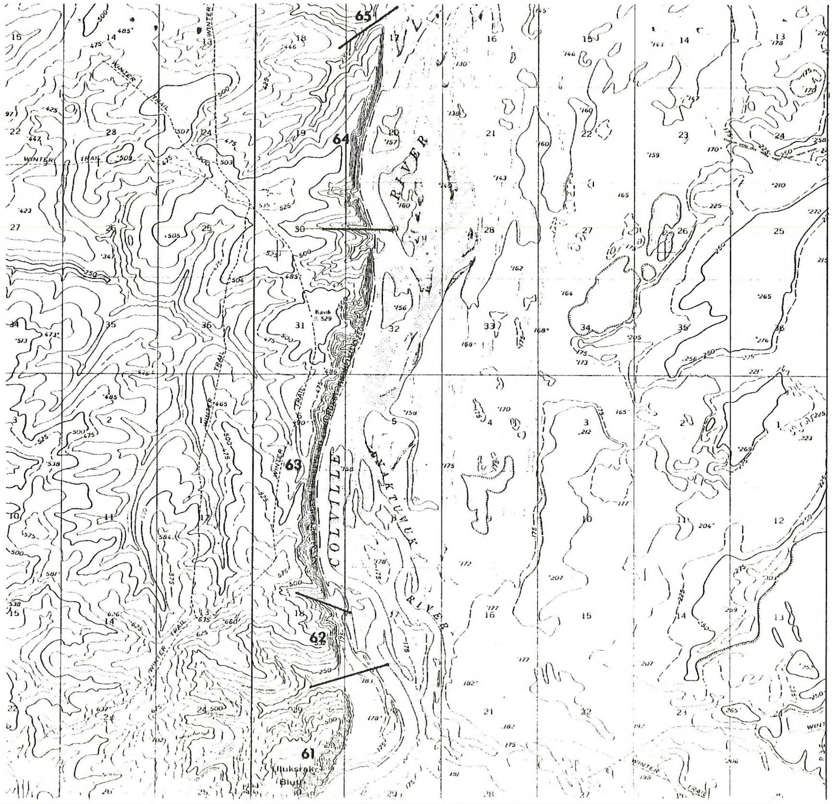

COLVILLE
RIVER
Creek
Creek
Fossil Creek
WINTER TRAIL
WINTER TRAIL
NAVAL PETROLEUM RESERVE
BOUNDARY
52
51

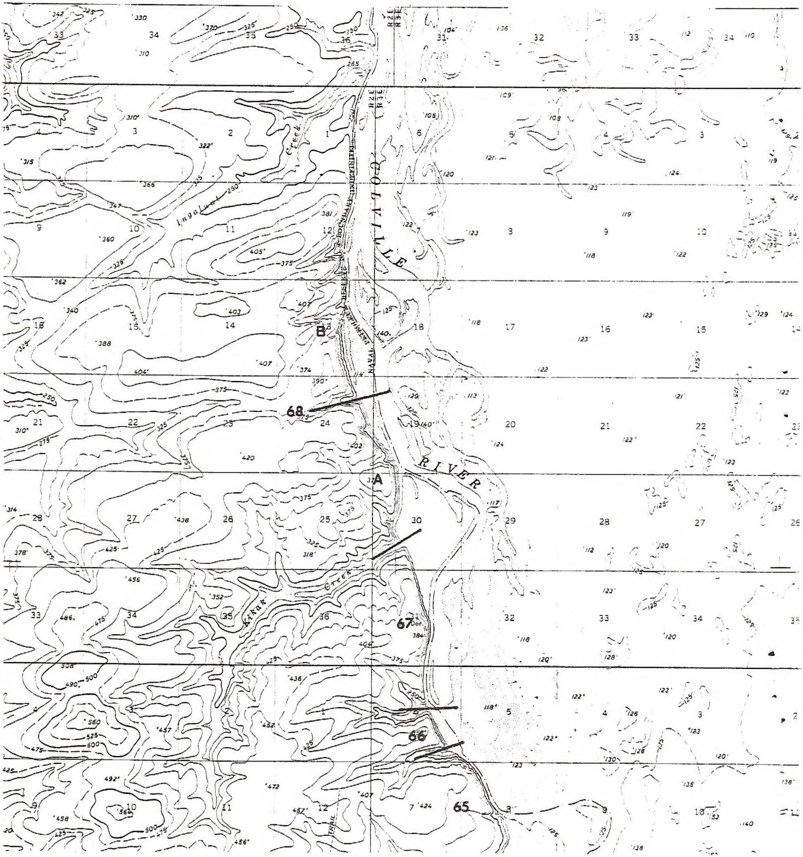

Bearpaw
WINTER TRAIL
Gasoline Dump
BASE LINE
Seabee
Creek
56
Umiat Airfield
Beacon
Umiat
Docks
COLVILLE
RIVER
Tattitgak Bluff
54
55
Trail
Rainy
Creek
53
Fossil



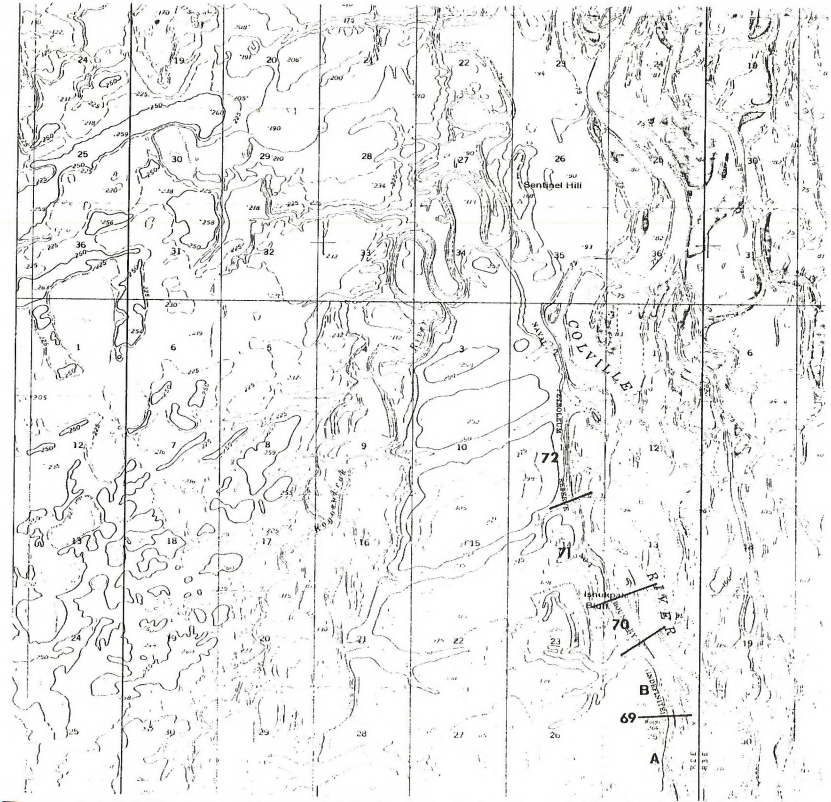
UMIAT
Creek
M R E S E R V E N O 4
WINTER TRAIL
Shivugak Bluff
58
RIVER
Creek
57
Umiat Mountain
BASE LINE
Tower
Umiat Lake
COLVILLE

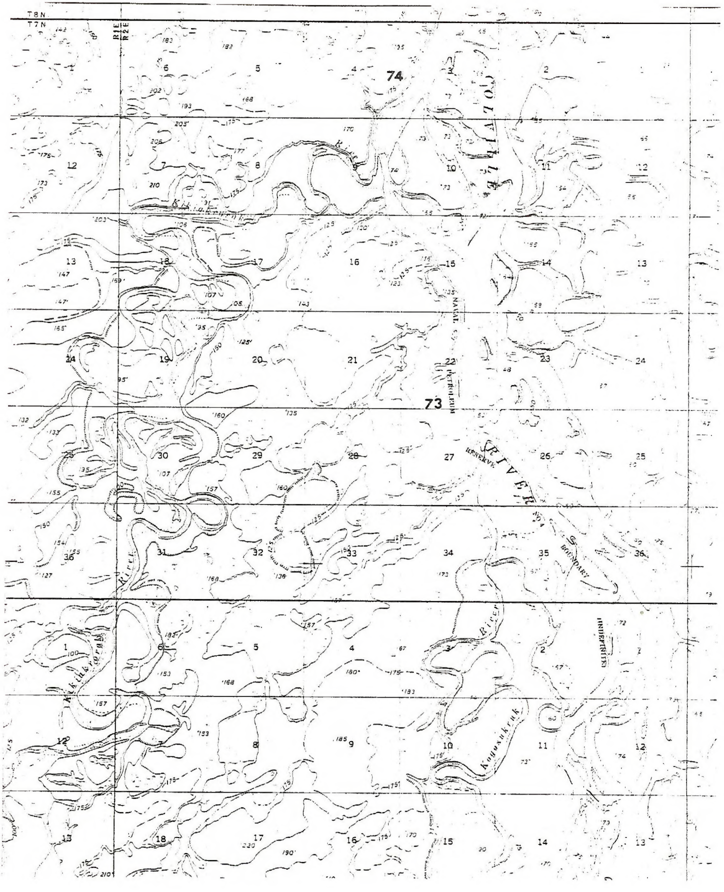

Uluksrak Bluff
61
60
59
A
B
C
WINTER TRAIL
NAVAL
RIVER
COLVILLE
T 1 N BASE LINE
R 1 E
R 2 E

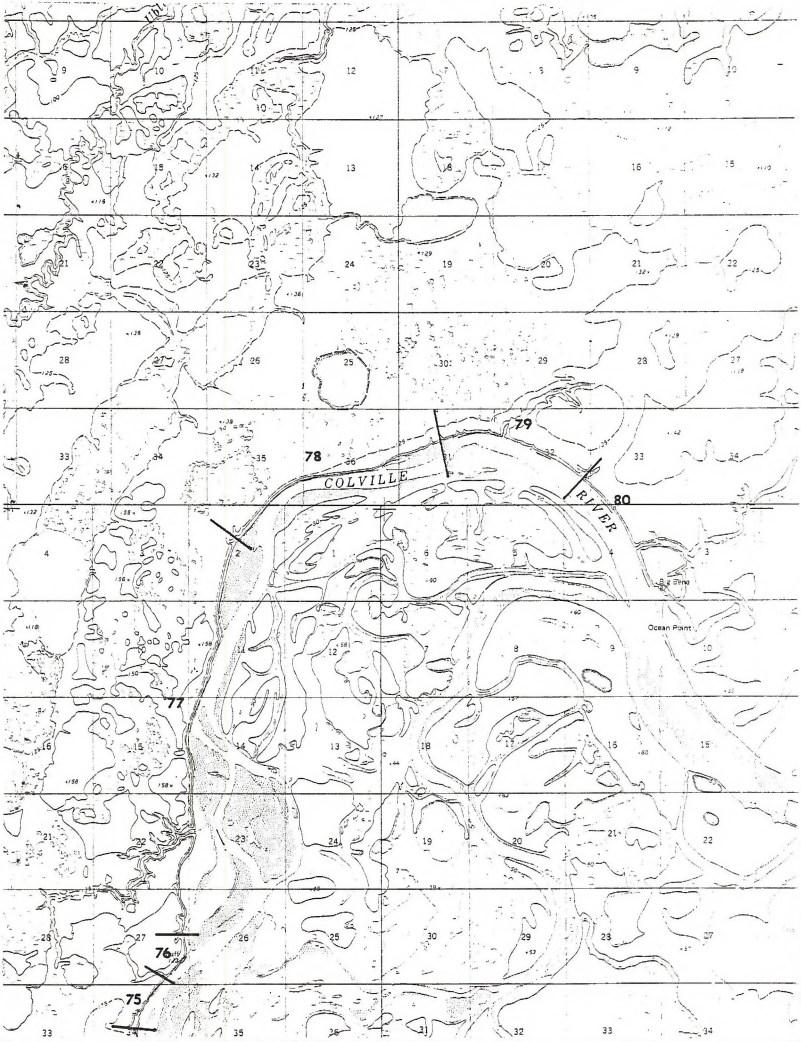

COLVILLE
ANAKTUVUK RIVER
RIVER
Kavik 529
Uluksrak Bluffs
WINTER TRAIL
61
62
63
64
65



R2E
R3E
COQUILLE
RIVER
NAVAL RESERVE BOUNDARY (INDEFINITE)
Creek
Creek
TRAIL
B
A
68
67
66
65


Sentinel Hill
COLVILLE
72
71
70
B
69
A


T8N
T7N
R1E
R2E
74
73
River
NAVAL
PETROLEUM
RESERVE
RIVER
BOUNDARY
UNDEFINED
River
Kogosukruk
River


78
COLVILLE
RIVER
79
80
77
76
75
Ocean Point